DACW-33-85-D-0011 Delivery Order 0021
Farmington River Basin, Simsbury CT

OFFICE COPY DO NOT REMOVE

ATLANTIC TESTING LABORATORIES, Limited

Reply To: ( ) CANTON
( ) CICERO
( ) UTICA

June 16, 1987

U.S. Army Corps of Engineers
New England Division
424 Trapela Road
Waltham, MA 02254-9149

Attn: Mr. Richard D. Reardon

Re: Subsurface Exploration Final Report
Farmington River Basin
Simsbury, Connecticut
Contract DACW33-85-D-0011
Delivery Order No. 0021
Report No. CD023-1A-6-87

Gentlemen:

In accordance with Delivery Order No. 0021, dated April 3, 1987, attached are one copy of our final report detailing the subsurface investigation performed at the above referenced site.

By copy of this letter, we are also transmitting two copies of this report to the Chief of the Geotechnical Branch.

If you have any questions or comments, please do not hesitate to contact our office.

Respectfully submitted,

Paul M. Fisher, P.E.
Geotechnical Engineer

PMF/sg

Enclosures

2cc: A.F. Mancini - Chief of the Geotechnical Branch

SECTION 1

DRAFT REPORT OF SUBSURFACE EXPLORATION

FARMINGTON RIVER BASIN

SIMSBURY, CONNECTICUT

CONTRACT DACW-33-85-D-0011
CONTRACTING OFFICER:
Edward D. Hammond, LTC, CE
28 June 1985

DELIVERY ORDER NO. 0021
3 APRIL 1987

PREPARED FOR: U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02254-9149

PREPARED BY: Paul M. Fisher, P.E.
Atlantic Testing Laboratories, Limited
P. O. Box 356
Cicero, New York 13039

June 16, 1987

ATL Report No. CD023-1-6-87

SECTION 2

TABLE OF CONTENTS

SECTION 3

SCOPE OF INVESTIGATION

a. Delivery Order No. 0021

b. Project Site

The two borings were located south of Simsbury, Connecticut, along the west bank of the Farmington River and east of the abondoned railroad right-of-way formerly owned by Penn Central. Boring FD-87-1 (A) was staked by the Corps of Engineers, in a moderately wooded area approximately 33 feet above the river surface. Clearing of some small trees was required. The abandoned railroad cight-of-way was used to access this boring. The sewer line access road, located adjacent to the river, was the site for Boring FD-87-2 (B). This was approximately 6 feet above the river surface and was staked, by the Corps of Engineers, roughly midway between the sewer line and the river. Crossing of privately owned property was required to gain access to this boring.

c. Purpose

Channel improvements are planned for certain sections of the Farmington River. Information retrieved from the subsurface investigation will be used to determine foundation conditions for a proposed bank protection project. This protection is required to control the undermining of the sewer line which runs adjacent to the river.

d. Scope of Work

Two (2) borings were to be performed in accordance with Delivery Order 0021, dated April 3, 1987. These were designated as FD-87-A and FD-87-B. Samples were to be retrieved using a 1-3/8 inch I.D. driven split spoon, as directed, with final depths proposed at 70 feet and 50 feet for Boring FD-87-A and FD-87-B, respectively. Standard Penetration Tests (SPT), using a 1-3/8" I.D. sampler, were to be performed in accordance with ASTM D-1586. Down hole vane shear tests, ASTM D-2573, were to be performed in the varved clay zone, between SPT's, at 10-foot intervals.

General inspection, exploration and vane shear test instructions were provided by the Army Corps of Engineers, New England Division, through the contract "Specifications for Services and Equipment Necessary for Conducting Geotechnical Exploratory Work, Various Locations in New England, and New York" and through Delivery Order No. 0021, which is included in Section 3a. Specific instructions and changes during the course of work were given verbally during on-site and phone conversations through a Corps of Engineers representative. Pertinent instructions and changes can be found listed in Table I and Table II of Section 5, herewith.

CHECKED BOX APPLIES: [X] ORDER FOR SUPPLIES OR SERVICES

[ ] REQUEST FOR QUOTATIONS NO.
RETURN COPY(IES) OF THIS QUOTE BY
(THIS IS NOT AN ORDER. See DD Form 1155r)

PAGE 1 OF 2

5. CERTIFIED FOR NATIONAL DEFENSE UNDER DMS REG 1
DO

CONTRACT/~~PURCHASE~~ ORDER NO.	2. DELIVERY ORDER NO.	3. DATE OF ORDER	4. REQUISITION/PURCH REQUEST NO.
DACW33-85-D-0011	0021	87 APR 03	GEB 87-46

6. ISSUED BY: Dept. of the Army CODE
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, MA 02254-9149
Buyer/Symbol:Apidianakis/NEDCT-C Telephone: Area Code 617/647-8207

7. ADMINISTERED BY: *(If other than 6)* CODE

8. DELIVERY FOB
[X] DEST
[ ] OTHER
(See Schedule if other)

9. CONTRACTOR/QUOTER CODE FACILITY CODE

NAME AND ADDRESS
Atlantic Testing Laboratories, Ltd.
P. O. Box 29
Canton, New York 13617

10. DELIVER TO FOB POINT BY:
In accordance with Paragraph 7 of ~~Attachment~~ No. 1

11. CHECK IF BUSINESS IS
[X] SMALL
[ ] SMALL DISADVANTAGED
[ ] WOMEN-OWNED

12. DISCOUNT TERMS

13. MAIL INVOICES TO: Finance & Accounting Officer at Issuing Office

14. SHIP TO: Services for: CODE
U. S. Army Engineer Division, New England
ATTN: Geotechnical Engineering Branch
424 Trapelo Road
Waltham, Massachusetts 02254-9149

15. PAYMENT WILL BE MADE BY: CODE
Finance and Accounting Officer at Issuing Office

MARK ALL PACKAGES AND PAPERS WITH CONTRACT OR ORDER NUMBER

16. TYPE OF ORDER
DELIVERY [X] This delivery order is subject to instructions contained on this side of form only and is issued ~~subject to the terms and conditions~~ for supplies or services in accordance with and subject to terms and conditions of above numbered contract.
PURCHASE [ ] Reference your ~~dated~~ furnish the following on terms specified herein, including, for U.S. purchases.
General Provisions of Purchase Order on DD Form 1155r *(EXCEPT CLAUSE NO. 12 APPLIES ONLY IF THIS BOX [ ] IS CHECKED, AND NO. 14 IF THIS BOX [ ]*
17. CHECKED, special provisions ; and delivery as indicated. This purchase is negotiated under authority of 10 USC 2304(a)( ) or as specified in the schedule if within U.S., its possessions or Puerto Rico, if otherwise under 2304(a)(6).
[ ] *If checked, Additional General Provisions apply. Supplier shall sign "Acceptance" on DD Form 1155r and return* copies.

SBSA STATUS
GEB AE/PI
80.

18. ACCOUNTING AND APPROPRIATION DATA/LOCAL USE
96X3122 Construction General
BE954307100000 (HD)
Contract

19. ITEM NO.	20. SCHEDULE OF SUPPLIES/SERVICES	21. QUANTITY ORDERED/ ACCEPTED *	22. UNIT	23. UNIT PRICE	24. AMOUNT
	Furnish necessary equipment, services, and personnel to determine foundation conditions for proposed bank protection along Farmington River, Simsbury, Connecticut, in accordance with Attachment No. 1.	APPROX.			ESTIMATED
1.1	Geologist	40	HR	$ 40.00	$1,600.00
1.2	Per Diem - Overnight Stay	3	DAY	45.00	135.00
1.4	Mileage from Waltham, MA and Return	194	MI	.35	67.90
					ESTIMATED

4/3/87

* *If quantity accepted by the Government is same as quantity ordered, indicate by ✓ mark. If different, enter actual quantity accepted below quantity ordered and encircle.*

24. UNITED STATES OF AMERICA
BY: THOMAS A. RUSH, Colonel, CE
Division Engineer
CONTRACTING/ORDERING OFFICER

25. TOTAL $10,800.00
29. DIFFERENCES

26. QUANTITY IN COLUMN 20 HAS BEEN
[ ] INSPECTED [ ] RECEIVED [ ] ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS NOTED

27. SHIP. NO.
[ ] PARTIAL [ ] FINAL

28. D.O. VOUCHER NO.

30. INITIALS

32. PAID BY

33. AMOUNT VERIFIED CORRECT FOR

DATE SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE

31. PAYMENT
[ ] COMPLETE [ ] PARTIAL [ ] FINAL

34. CHECK NUMBER

35. BILL OF LADING NO.

SIGNATURE AND TITLE OF CERTIFYING OFFICER

36. DATE VOUCHER RECEIVED | 37. DATE RECEIVED | 38. TOTAL CONTAINERS | 39. S/R ACCOUNT NUMBER | 40. S/R VOUCHER NO.

PREVIOUS EDITION WILL BE USED UNTIL EXHAUSTED

STANDARD FORM 30 (REV. 10-83)
GENERAL SERVICES ADMINISTRATION
FAR (48 CFR) 53.243

CONTINUATION SHEET

REFERENCE NO. OF DOCUMENT BEING CONTINUED
Delivery Order No. 0021 to
DACW33-85-D-0011

PAGE 2 OF 2

NAME OF OFFEROR OR CONTRACTOR
ATLANTIC TESTING LABORATORIES, LTD

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
		APPROX.			ESTIMATE
2.1	Geotechnical Report	1	JOB	60% of Line Item 1.1	$960.00
6.1	Mobilization and Demobilization	1	JOB	$700.00	700.00
6.2	Mileage from/to Waltham, MA	194	MI	1.15	223.10
6.5	Standby time/on site moves	12	HR	75.00	900.00
12.3	Hollow Stem Auger, 4" I.D.	160	LF	22.00	3,520.00
13.1	0-30 ft. depth	14	EA	13.00	182.00
13.2	31-50 ft. depth	8	EA	16.00	128.00
13.3	51-100 ft. depth	4	EA	20.00	80.00
31.3	Vane Shear Test	8	EA	300.00	2,400.00

ATTACHMENT NO. 1
GEB REQUISITION NO. 87-46 - DACW 33-85-D-0011
DELIVERY ORDER NO. 21
INSPECTION AND EXPLORATION INSTRUCTIONS

PROJECT: Simsbury Bank Protection Project

SITE: Farmington River, Simsbury, CT

PURPOSE: To determine foundation conditions for a proposed bank protection project along the Farmington River

1. SCOPE OF INVESTIGATION.

a. Provide a geotechnical inspector and perform two (2) test borings along the Farmington River, Simsbury, Connecticut. Borings shall consist of cased holes (hollow stem auger), standard penetration tests (SPT) and vane shear tests.

b. Borings designated "A" and "B" are located in the field with stakes. Ground surface elevations shall be estimated from hand level measurements taken from the temporary bench mark (manhole) elevation indicated in attachment #2 on Sketch No. 2.

c. (1) Overburden sampling and testing shall be performed in accordance with American Society for Testing and Materials (ASTM) SPT and vane shear test procedures. Sampling and testing shall be to refusal or to final overburden sampling depth as specified below.

(2) Refusal is defined as 100 blows with no penetration or bouncing refusal. When refusal is encountered prior to reaching the specified overburden sampling depth, the geologist shall call Mr. J. Hart or T. Wong at 617-647-8389 for further instructions. Overburden sampling depths shall be 70 feet in boring "A" and 50 feet in boring "B".

(3) Hollow stem auger shall be used to maintain an open hole.

d. Vane shear tests shall be performed in the varved clay zone between SPT. The spacing of the shear tests shall be at about 10 foot intervals. The vane shall be located 18 inches below the bottom of the previous SPT and at least 12 inches above the next. Rate of shear and size of vane along with the procedure for performing the test is discussed in attachment # 3. Selection of the vane size is directly related to the consistency of the soil, that is, the softer the soil the larger the vane diameter. Initially, the diameter of the field vane shall be 3-5/8 inches. If stiff soils are encountered, the vane size may have to be reduced. The diameter shall not be reduced without the full consent of Mr. Hart or Mr. Wong.

e. A geologist shall act as field inspector for all testing. The inspector shall provide telephone reports to Mr. J. Hart or Mr. T. Wong, Corps of Engineers, at 617-647-8389 between the hours of 8:00 am and 9:00 am before the start of each working day for the duration of this contract.

f. All soil samples shall be delivered to the NED Materials and Water Quality Laboratory, Waltham, MA in coordination with the Director at 617-647-8367/8392.

2. SITE CONDITIONS

a. Boring "A" is located on a small hill with large trees and "B" is located in the open along a sewer line. Both are between the river and a pair of abandoned railroad tracks owned by Penn Central. Copies of boring logs (by others) and their locations are in attachment # 4.

b. Access to the borings may be obtained in one of two ways. There is a road on the river side of the railroad right of way which can be utilized for access. There is also a road along the sewer alignment adjacent to the river which can be accessed beside and behind a large barn. The location of potential access roads and boring locations will be discussed between Government representatives and the Contractor prior to the start of work.

c. Care must be exercised by the Contractor, not to endanger the integrity of the 30" or 36" municipal sewer pipe during drilling operations. There is insufficient soil cover over various portions of the sewer pipe to preclude damage to the pipe under the weight of drilling equipment. The areas must be avoided during pipeline crossings to prevent possible damage to the pipe. The Contractor must not park his equipment above the sewer pipe. A copy of a 1/2 scale reduction of the plans for the sewer pipe in this location has been obtained and is in attachment # 4. (A full set of drawing of the sewer line is available at the Corps office in Waltham, Ma.). It is strongly recommended that the Contractor consult these plans before starting the work.

3. RIGHTS OF ENTRY.

The Contractor is responsible for securing rights of entry, approvals, permits, etc. necessary for the performance of the work.

4. COORDINATION.

Mr. J. Hart or T. Wong, Corps of Engineers, 617-647-8389, shall be contacted five days prior to start of work to notify the Government of when the work will begin and each work day to report on the progress of the work.

5. EXPLORATION NUMBERS

The drive sample borings are to be advanced by hollow stemmed auger and they are designated "A" and "B" as designated herein. The locations of these borings are shown in attachment # 2 on Sketch 2. The borings shall be numbered FD87-1 and FD87-2 in order of their completion.

The new number of each exploration shall be indicated on the exploration logs and shown on a plan of explorations.

6. GOVERNMENT REVIEW

The Government will review the draft geotechnical report submittal as well as the completed report. Subsequent to such review, the Contractor shall accomplish any corrections which may be directed as the result of the Government review.

7. COMPLETION SCHEDULE

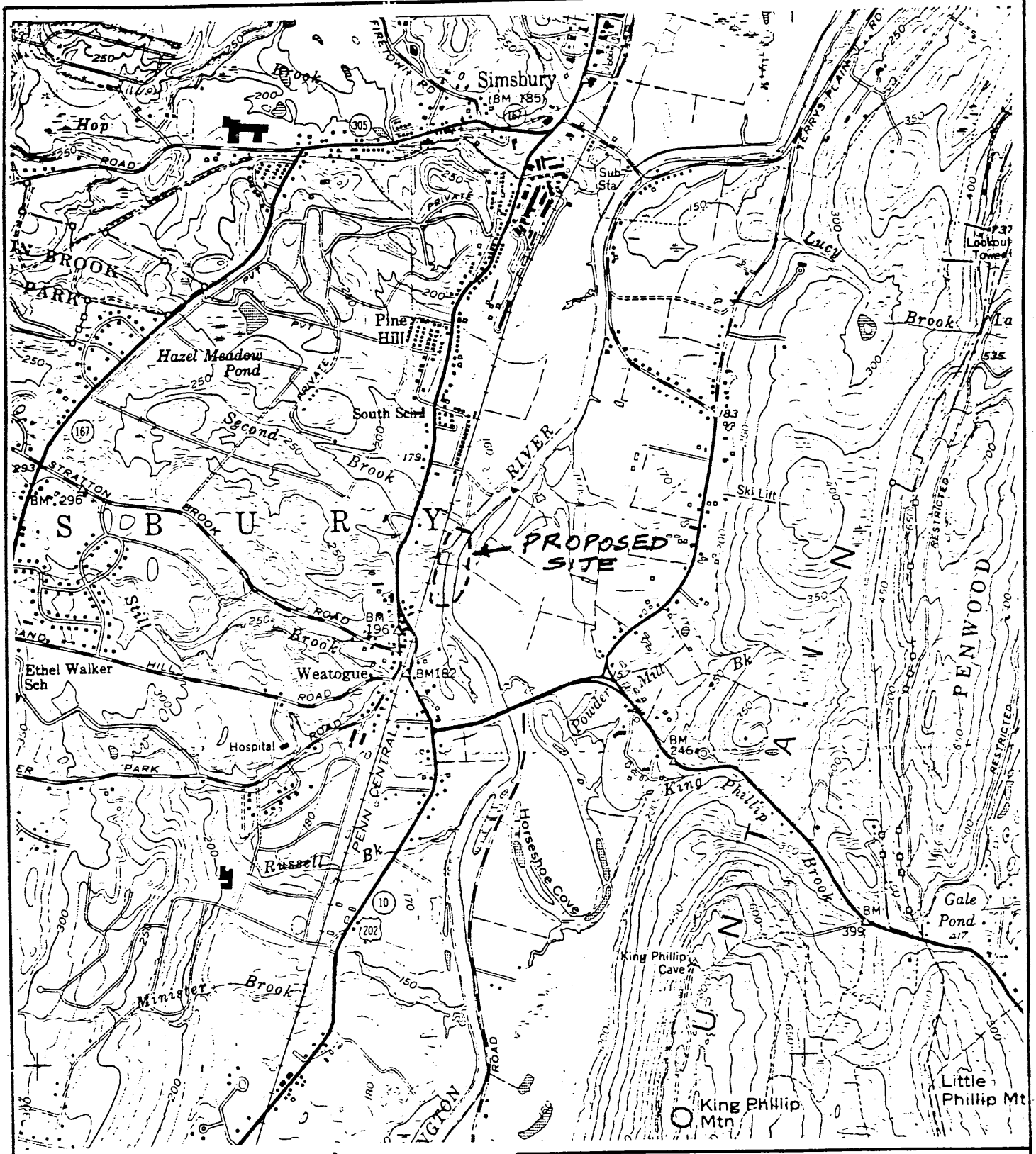
Services under this delivery order shall start within 7 calendar days after receipt of the delivery order. Duration of field work is estimated to be four work days. The geotechnical report shall be submitted in draft format for review by the Government no later than seven calendar days after completion of the field work. Review will take approximately seven calendar days from receipt of draft report. The final geotechnical report shall be submitted no later than seven calendar days after receipt of the corrected draft report including the action taken on possible comments.

8. QUALITY CONTROL

You will be held responsible for the quality of the submittals and for all damages caused the Government as a result of your negligence in the performance of any services furnished under the contract, especially any damage to the sewer line. The Contractor is responsible for contacting utility companies prior to the work and locating any and all possible underground utilities.

Although submissions required by your contract are technically reviewed by the government, it is emphasized that your work must be prosecuted using proper internal controls and review procedures. The letter of transmittal for each submission which you make shall include a certification that the submission has been subjected to your own review and coordination procedures to insure (a) completeness for each discipline commensurate with the level of effort required for that submission, (b) elimination of conflicts, errors and omissions and (c) the overall professional and technical accuracy of the submission. Documents which are significantly deficient in any of these area will be returned to you for correction and/or upgrading prior to completing our review. Contract submission dates will no be extended if a resubmission of draft material is required for this reason.

One item that will be performed in this contract that deserves special mention is the vane shear testing that will be performed in the boring holes. Item 31.3 is in your contract for the performance of vane shear testing. On page C-31 of your contract, in Item 31, it explains that vane shear testing must be performed in complete accordance with ASTM 2573. A copy of the ASTM specification D-2573 is attached (attachment no. 3) for your review. It is important that this vane shear testing be completed carefully and that reasonable and accurate shear strengths be obtained from this shear testing. Mr. J. Hart or T. Wong (Geotechnical Engineering Branch) of the Corps of Engineers, must be contacted (617-647-8389) prior to the performance of any vane shear testing for this project. Mr. T. Wong is planning to be present for the shear testing as the Government representative, in order to assure that the Corps is familiar with all the testing methods employed. If there are any questions about the conduct or the importance of vane shear testing, Mr. J. Hart or Mr. T. Wong of the Corps of Engineers shall be contacted.

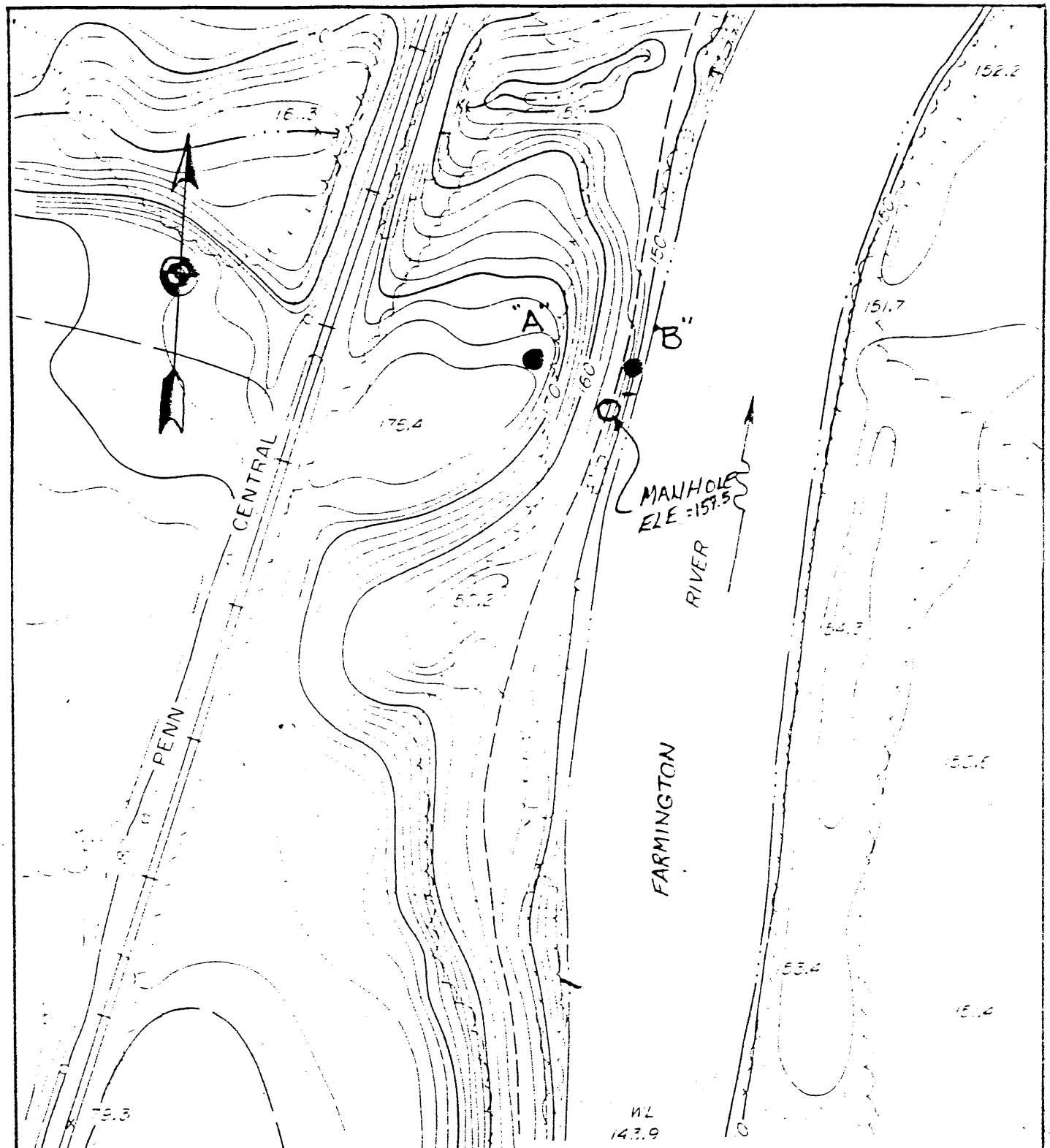


DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY PS	LOCATION PLAN
DR. BY PS	SECTION 14 STUDY
CK. BY	SIMSBURY, CONNECTICUT

GEOTECH. ENG. BR. SCALE: 1:24,000
SK. NO. 1 of 2 DATE: 6 JAN 86

ATTACHMENT #2



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY

DR. BY

CK. BY

PROPOSED BORING LOCATION PLAN
SECTION 14 STUDY
SIMSBURY, CONNECTICUT

GEOTECH. ENG. BR. SCALE: 1" = 100ft
SK. NO. 2 of 2 DATE: 11 Mar 87

Attachment #2

Designation: D 2573 – 72 (Reapproved 1978)

An American National Standard

Standard Method for FIELD VANE SHEAR TEST IN COHESIVE SOIL[1]

This standard is issued under the fixed designation D 2573; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This method covers the field vane test in soft, saturated, cohesive soils. Knowledge of the nature of the soil in which each vane test is to be made is necessary for assessment of the applicability and interpretation of the test.

2. Summary of Method

2.1 The vane shear test basically consists of placing a four-bladed vane in the undisturbed soil and rotating it from the surface to determine the torsional force required to cause a cylindrical surface to be sheared by the vane; this force is then converted to a unit shearing resistance of the cylindrical surface. It is of basic importance that the friction of the vane rod and instrument be accounted for; otherwise, the friction would be improperly recorded as soil strength. Friction measurements under no-load conditions (such as the use of a blank stem in place of the vanes, or a vane that allows some free rotation of the rod prior to loading) are satisfactory only provided that the torque is applied by a balanced moment that does not result in a side thrust. As torsional forces become greater during a test, a side thrust in the instrument will result in an increase in friction that is not accounted for by initial no-load readings. Instruments involving side thrust are not recommended. The vane rod may be of sufficient rigidity that it does not twist under full load conditions; otherwise a correction must be made for plotting torque-rotation curves.

3. Apparatus

3.1 The vane shall consist of a four-bladed vane as illustrated in Fig. 1. The height of the vane shall be twice the diameter. Vane dimensions shall be as specified in Table 1. Sizes other than those specified in Table 1 shall be used only with the permission of the engineer in charge of the boring program. The ends of the vane may be tapered (see Fig. 1). The penetrating edge of the vane blade shall be sharpened having an included angle of 90 deg.

3.2 The vane shall be connected to the surface by means of steel torque rods. These rods shall have sufficient diameter such that their elastic limit is not exceeded when the vane is stressed to its capacity (Note 1). They shall be so coupled that the shoulders of the male and female ends shall meet to prevent any possibility of the coupling tightening when the torque is applied during the test. If a vane housing is used, the torque rods shall be equipped with well-lubricated bearings where they pass through the housing. These bearings shall be provided with seals to prevent soil from entering them. The torque rods shall be guided so as to prevent friction from developing between the torque rods and the walls of casing or boring.

NOTE 1—If torque *versus* rotation curves are to be determined, it is essential that the torque rods be calibrated (prior to use in the field). The amount of rod twist (if any) must be established in degrees per foot per unit torque. This correction becomes progressively more important as the depth of the test increases and the calibration must be made at least to the maximum depth of testing anticipated.

3.3 Torque shall be applied to the torque rods, thence to the vane. The accuracy of the torque reading should be such that it will produce a variation not to exceed ±25 lb/ft² (1.20 kPa) shear strength.

3.4 It is preferable to apply torque to the vane with a geared drive. In the absence of a geared drive, it is acceptable to apply the torque directly by hand with a torque wrench or equivalent. The duration of the test should be controlled by the requirements of 4.3.

4. Procedure

4.1 In the case where a vane housing is used, advance the housing to a depth which is at least five vane housing diameters less than the desired depth of the vane tip. Where no vane housing is used, stop the hole in which the vane is lowered at a depth such that the vane tip may penetrate undisturbed soil for a depth of at least five times the diameter of the hole.

4.2 Advance the vane from the bottom of the hole or the vane housing in a single thrust to the depth at which the test is to be conducted. Take precautions to make sure no torque is applied to the torque rods during the thrust.

4.3 With the vane in position, apply the torque to the vane at a rate which should not exceed 0.1 deg/s. This generally requires a time to failure of from 2 to 5 min, except in very soft clays where the time to failure may be as much as 10 to 15 min. In stiffer materials, which reach failure at small deformations, it may be desirable to reduce the rate of angular displacement so that a reasonable determination of the stress-strain properties can be obtained. During the rotation of the vane, hold it at a fixed elevation. Record the maximum torque. With apparatus with geared drives, it is desirable to record intermediate values of torque at intervals of 15 s or at lesser frequency if conditions require.

4.4 Following the determination of the maximum torque, rotate the vane rapidly through a minimum of 10 revolutions; the determination of the remoulded strength should be started immediately after completion of rapid rotation and in all cases within 1 min after the remoulding process.

4.5 In the case where soil is in contact with the torque rods, determine the friction between the soil and the rod by means of torque tests conducted on similar rods at similar depths with no vane attached. Conduct the rod friction test at least once on each site; this shall consist of a series of torque tests at varying depths.

4.6 In apparatus in which the torque rod is completely isolated from the soil, conduct a friction test with a blank rod (Note 2) at least once on each site to determine the magnitude of the friction of the bearings. In a properly functioning vane apparatus, this friction should be negligible.

NOTE 2—In some cases it is not necessary to remove the vane for the friction test. As long as the vane is not in contact with the soil, that is, where it is retracted into a casing, the friction measurement is not affected.

4.7 Conduct undisturbed and remoulded vane tests at intervals of not less than 2½ ft (0.76 m) throughout the soil profile when conditions will permit vane testing (Note 3). Do not conduct the vane test in any soil that will permit drainage or dilates during the test period, such as sands or silts or in soils where stones or shells are encountered by the vane in such a manner as to influence the results.

NOTE 3—This spacing may be varied only by the engineer in charge of the boring program.

5. Calculation

5.1 Calculate the shear strength of the soil in the following manner: The turning moment required to shear the soil is as follows:

$$T = s \times K$$

where:

T = torque, lbf·ft (or N·m),
s = shear strength of the clay, lbf/ft² (or kPa), and
K = constant, depending on dimensions and shape of the vane, ft³ (or m³).

5.2 Assuming the distribution of the shear strength is uniform across the ends of a cylinder and around the perimeter, calculate the value of K as follows:

U.S. Customary Units:

$$K = (\pi/1728) \times (D^2H/2) \times [1 + (D/3H)]$$

Metric Units:

$$K = (\pi/10^6) \times (D^2H/2) \times [1 + (D/3H)]$$

where:

D = measured diameter of the vane, in. (or cm), and
H = measured height of vane, in. (or cm).

[1] This method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock.

Current edition approved Jan. 17, 1972. Published February 1972. Originally published as D 2573 – 67 T. Last previous edition D 2573 – 67 T.

ATTACHMENT # 3

It is important that these dimensions are checked periodically to ensure the vane is not distorted or worn.

5.3 As the ratio of length to breadth of the vane is 2:1, the value of K may be simplified in terms of the diameter so that it becomes the following:

U.S. Customary Units:

$$K = 0.0021D^3$$

Metric Units:

$$K = 0.00000366D^3$$

5.4 Since the value of s is required, it is more useful to write the equation as follows:

$$s = T \times k$$

where:

$k = 1/K$ and

T, the torque, is measured so that s can be calculated.

5.5 For the tapered vane of Fig. 1, the following modified equation may be used for the vane constant:

U.S. Customary Units:

$$K = 1/1728\ [\pi D^3 + 0.37\ (2D^3 - d^3)]$$

Metric Units:

$$K = 1/10^6\ [\pi D^3 + 0.37\ (2D^3 - d^3)]$$

where:

d = rod diameter, in. (cm). For a ½-in. (1.27-cm) rod this reduces to

U.S. Customary Units:

$$K = 0.00225D^3 - 0.00003$$

Metric Units:

$$K = 0.00000388D^3 - 0.00000076$$

6. Report

6.1 For each vane test record the following observations:

6.1.1 Date of the test,

6.1.2 Boring number,

6.1.3 Size and shape of the vane (tapered or rectangular),

6.1.4 Depth of the vane tip,

6.1.5 Depth of the vane tip below the housing or bottom of the hole,

6.1.6 Maximum torque reading, and intermediate readings if required for the undisturbed test,

6.1.7 Time to failure of the test,

6.1.8 Rate of remoulding,

6.1.9 Maximum torque reading for the remoulded test, and

6.1.10 Notes on any deviations from standard test procedure.

6.2 In addition, record the following observations for the boring:

6.2.1 Boring number,

6.2.2 Location,

6.2.3 Log of the soil conditions,

6.2.4 Reference elevation,

6.2.5 Method of making the hole,

6.2.6 Description of the vane, that is, housed or not,

6.2.7 Description of the method of applying and measuring the torque,

6.2.8 Notes on the driving resistance,

6.2.9 Name of the drilling foreman, and

6.2.10 Name of the supervising engineer.

TABLE 1 Recommended Dimensions of Field Vanes[a]

Casing Size	Diameter, in. (mm)	Height, in. (mm)	Thickness of Blade, in. (mm)	Diameter of Vane Rod, in. (mm)
AX	1½ (38.1)	3 (76.2)	1/16 (1.6)	½ (12.7)
BX	2 (50.8)	4 (101.6)	1/16 (1.6)	½ (12.7)
NX	2½ (63.5	5 (127.0)	⅛ (3.2)	½ (12.7)
4 in. (101.6 mm)[b]	3⅝ (92.1)	7¼ (184.1)	⅛ (3.2)	½ (12.7)

[a] Selection of the vane size is directly related to the consistency of the soil being tested, that is, the softer the soil the larger the vane diameter.

[b] Inside diameter.

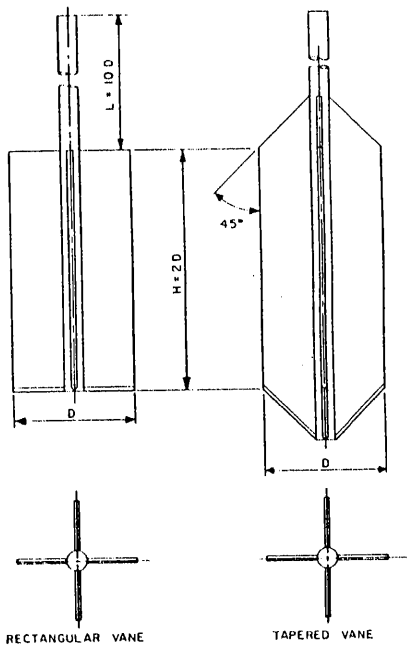
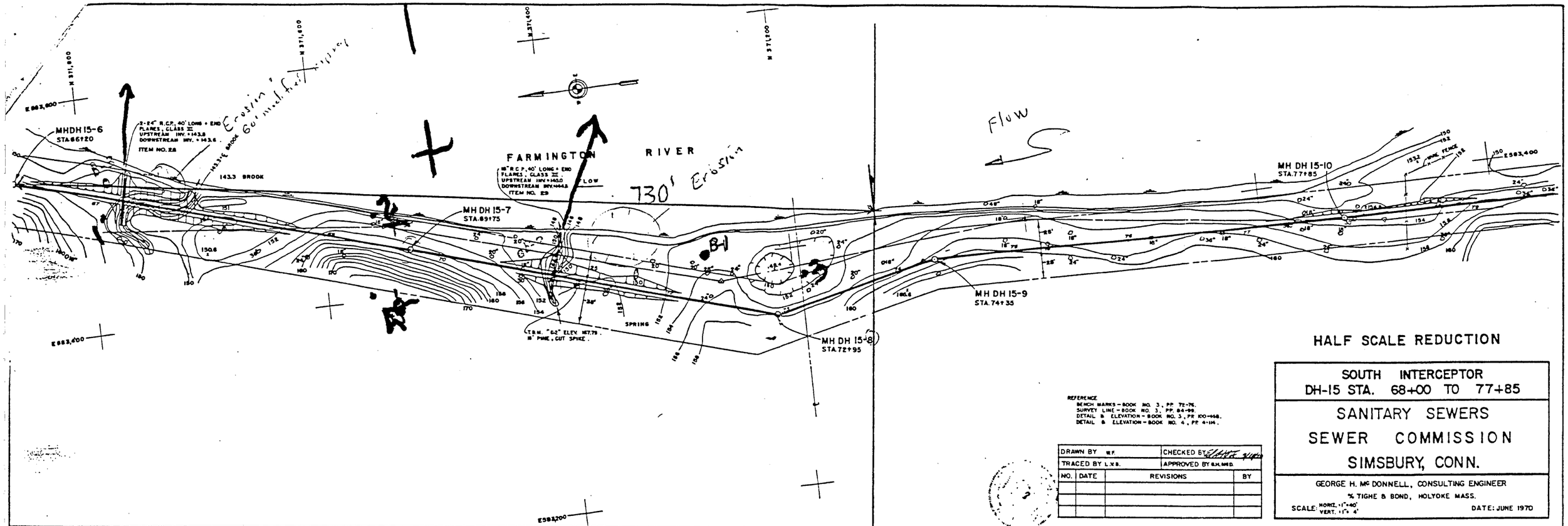


FIG. 1. Geometry of Field Vane.

2

ATTACHMENT #3



HALF SCALE REDUCTION

REFERENCE
BENCH MARKS – BOOK NO. 3, PP. 72-76.
SURVEY LINE – BOOK NO. 3, PP. 84-99.
DETAIL & ELEVATION – BOOK NO. 3, PP. 100-148.
DETAIL & ELEVATION – BOOK NO. 4, PP. 4-114.

DRAWN BY W.F.	CHECKED BY
TRACED BY L.V.B.	APPROVED BY G.H. McD.

NO.	DATE	REVISIONS	BY

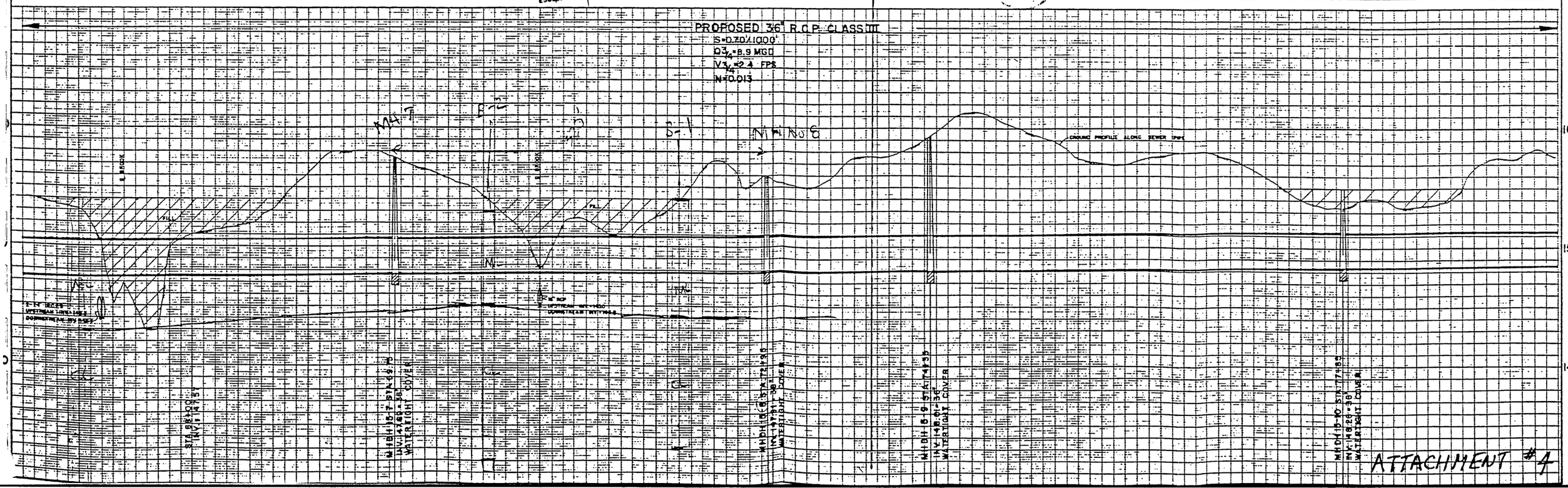
SOUTH INTERCEPTOR
DH-15 STA. 68+00 TO 77+85

SANITARY SEWERS
SEWER COMMISSION
SIMSBURY, CONN.

GEORGE H. McDONNELL, CONSULTING ENGINEER
% TIGHE & BOND, HOLYOKE MASS.

SCALE: HORIZ. 1" = 40'
VERT. 1" = 4'

DATE: JUNE 1970



ATTACHMENT #4

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. Sewer Line/Simsbury

CLIENT TOWN OF SIMSBURY

BORING NO. B-1

LINE & STA.

OFFSET

GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
1.0	light br.fine sand		
	drk.br.silt,some fine sand, tr.clay		
10.0			
	light br.clay,fine sand lenses,some silt TUBE #1 10'-12' rec.23"		
	TUBE #2 20'-22' rec.18"		
22.0			
	BOTTOM OF BORING 22.0 WATER AT 9' @ 0 hrs.		
	DATE: 5/9/84 DRILLER: HARRISON		

BORING NO. B-2

LINE & STA.

OFFSET

GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
2.0	drk.br.sandy topsoil		
5.0	light.br.silt,tr. clay,fine sand		
8.0	light br.fine-med. sand,some fine-med. gravel		
	br.clay,silt, some fine sand TUBE #1 10'-12' rec.14"		
	TUBE #2 20'-22' rec.24"		
22.0			
	BOTTOM OF BORING 22.0 NO WATER @ 0 hrs.		
	DATE: 5/9/84 DRILLER: HARRISON		

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = O.D. SPLIT SPOON

AND - 40 to 50%
SOME - 10 to 40%

ATTACHMENT #4

Trio Printers # 1127

CLARENCE WELTI ASSOC., INC.
P.O. BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. Sewer Line

CLIENT TOWN OF SIMSBURY

BORING NO. B-3

LINE & STA.

OFFSET

GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
	drk.br.fine sand, silt		
2.0	br.fine-med.sand, some fine-med.gravel		
4.0	drk.br.& blk.silt, some fine sand, clay	1-1-1	
11.0	light br.silt, clay,tr.fine sand	1-1-3	
	TUBE #1 15'-17'		
		2-5-5	
	TUBE #2 25'-27'		
27.0	BOTTOM OF BORING 27.0		
	WATER AT 9' @ 0 hrs. DATE: 8/24/84 DRILLER: HARRISON		

BORING NO. B-4

LINE & STA.

OFFSET

GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
	br.fine-med.sand. some silt, fine gravel		
4.0	br.silt, fine sand, tr.clay	1-1-1	
10.0	red/br.silt,some clay,tr.fine sand	3-3-3	
	TUBE #1 15'-17'		
	TUBE #2 20'-22'		
25.0	BOTTOM OF BORING 25.0	3-6-6	
	DATE: 8/24/84 DRILLER: HARRISON		

Trio Printers # 1127

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = ____ O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

ATTACHMENT #

SECTION 4

QUALITY CONTROL

a. General Certification Statement

I hereby certify that the records, equipment and procedures mentioned below were used to perform the subsurface exploration described herein. I also certify that the work was performed in a professional manner and meets the requirements set forth in the delivery order. This report has been subject to my review and is both complete and technically accurate.

CERTIFIED, June 16, 1987

Spencer F. Thew, P.E./L.S.

b. Records Taken

An Atlantic Testing Laboratories, Limited, 2-man drill crew, accompanied by a Geotechnical Engineer, was generally at the referenced site from May 26, 1987 to May 28, 1987. The engineer collected the drilling data and soil samples. Pertinent drilling procedures, sampling operations, soil classifications, and testing data were noted on the following forms, most of which were provided for use by the Corps of Engineers:

NED 121 (Field Log of Test Boring, Summary)
NED 58 (Field Log of Test Borings, Log Construction Page)
NED 58A (Continuation of NED 58)
NED 59 (Subsurface Water Observations and Boring Location Sketch)
ATL (Field Vane Shear Test Report)

A completed series of logs for each of the borings are included in Section 8, Field Inspector's Logs. Surface elevations noted on the logs were provided by the Corps of Engineers. The original boring designations were changed to numerical designations upon the start of each boring exploration, i.e. FD-87-A is FD-87-1 and FD-87-B is FD-87-2.

A Corps of Engineers label (ENG form 1742) was completed and affixed to each sample jar. The soil samples were transferred to Corps of Engineers' representative Gerard Boadreau in Waltham, Mass. Samples were delivered in marked boxes on May 29, 1987, totaling 2 boxes.

A summary of daily activities and telephone conversations can be found in Tables I and II of Section 5. Also documented during the project operations were one chain of custody log and one safety meeting report, located in Sections 6 and 7, respectively. Note that exposure time for ATL, Corps and subcontracted personnel were included on the safety meeting reports.

c. Equipment Used

All personnel, equipment and supplies were provided by Atlantic Testing Laboratories, Limited. A listing of pertinent drilling, sampling, and testing equipment follows:

- Mobile B-57 Truck-mounted drill rig
- 140 lb. hammers
- AW and NW taper threaded drill rod, in 5 feet and 10 feet lengths; used for sampling and turning 3-1/8-inch roller bit
- Auger, 4-1/4-inch ID, 8-1/2 inch OD, slot fit, hollow stem augers in 5 feet lengths with carbide tip teeth
- One 1-1/2-inch centrifugal pumps
- Split spoon sampler 1-3/8-inch ID by 2 feet in length
- S & H Down Hole Vane Shear Tester
- 3" Wide x 6" Long Vane
- 32-ounce sample jars

d. Procedures

A total of two (2) borings were performed at the referenced site. This involved coordination, gaining right-of-entry, accessing the boring sites, drilling, soil sampling and performing vane shear tests.

1. Coordination

   The on-site ATL Geotechnical Engineer gave a verbal project update, generally on a daily basis, to a Corps of Engineers representative. A Corps of Engineers representative was present on May 27, 1987 and May 28, 1987. An account of these conversations and project activities is summarized in Section 5. Changes to the delivery order have been noted in this section.

2. Right-of-entry

   Land owners and the Simsbury Water Pollution Control Department were contacted by the on-site engineer prior to the start of work. The sewer line was under the jurisdiction of the Simsbury Water Pollution Control Department.

3. Boring Access

   The drill rig was mounted on a single drive axle truck. The borings were accessed by two separate unimproved roads. Cutting of a few small trees was required at both locations. Some difficulties were encountered due to rain softened ground.

4. Drilling Procedures

   The two borings were performed using a truck-mounted Mobile B-57 drill rig. The borings were advanced and held open with the use of 4-1/4" I.D. hollow stem augers. A 3-7/8" tri-cone roller bit, along with pumped river water, was used to advance the boring and clean out cuttings from the inside of the augers. The Inspection Field Logs,

Section 8, contain the equipment and drilling methods used for each of the borings.

5. Soil Sampling

Samples were retrieved using a 1-3/8" I.D. split spoon, driven with a 140-pound hammer, falling 18 inches. The blow counts for each half-foot increment were recorded on the logs. Refusal was defined as 100 blows with no penetration or bouncing refusal. The 1-3/8" I.D. sampler was used for both borings, in accordance with ASTM Specification D-1586. The sampling schedule was on five-foot intervals starting from the surface. Rock coring was not required for either of the borings.

Samples were classified in the field in accordance with ASTM D-2488, without qualifying laboratory tests. Soil sample recovery, stratum changes and classifications were noted and can be found in the Inspector's Field Logs, Section 8. Representative samples were taken from each soil sampling run and placed into 32-ounce jars with hermetically sealed lids. Jars were labeled with the sticker (ENG Form 1742) provided to us by the Corps. A chain of custody log was maintained documenting custody of the samples between Atlantic Testing Laboratories, Limited and the Corps of Engineers.

6. Vane Shear Test

An S & H down hole vane shear testing apparatus was used in both borings in accordance with ASTM D-2573. The holes were held open with the use of 4-1/4" I.D. Hollow Stem Augers. The augers were advanced to undisturbed soil, just following a Standard Penetration Test (SPT), and cleaned out with a roller bit. The 3" diameter by 6" long vane was then pushed 18" into the undisturbed soil. A torque assembly was attached to the top auger and connected to the vane rod. The rod was rotated using the torque assembly at a rate of 0.1 degree per second. Once the maximum reading was obtained and recorded, the rod was turned rapidly 10 rotations. The maximum reading for the remolded condition was then acquired and recorded. The recorded data can be found on the Field Vane Shear Test Report which is included in the Field Log of Test Borings, Section 8. Information on the S & H Vane Shear Tester is included in Section 9.

SECTION 5

SUMMARY OF ACTIVITIES

AND

CONVERSATION LOGS

TABLE I

SUMMARY OF ACTIVITIES

DATE	ACTIVITY
Wednesday, March 25, 1987	- Geotechnical Engineer (Paul Fisher) first visit to site. Met with Terry Wong (Corps of Engineers) to preview proposed boring locations. Met with Mike Griffiths, Water Pollution Control, Simsbury, Connecticut (203-658-1380).
Tuesday, May 26, 1987	- Mobilized Geotechnical Engineer to site. Geotechnical Engineer on-site (1230 - 1700). Visited the Simsbury Water Pollution Control Facility and land owners regarding job site access. Visited proposed boring locations. Mobilized two-man drill crew (Paul Davis & Todd Burhnam) and Mobile B-57 drill rig to Simsbury, Connecticut.
Wednesday, May 27, 1987	- Geotechnical Engineer on-site (0700 - 1200/1230 - 1930). Logged soil samples retrieved from Boring FD-87-1 (A) and conducted two down hole vane shear tests. Safety meeting (0700 - 0730). Drillers Cleared path into wood and located drill rig over FD-87-A (0730 - 1030). Advanced Boring FD-87-1 (A) from the surface to its termination depth of 56 feet deep (1030 - 1800). Moved drill rig out of woods to parking area (1800 - 1900). Terry Wong on-site to observe sampling and vane shear tests (1130 - 1830).
Thursday, May 28, 1987	- Geotechnical Engineer on-site (0700 - 1400/1430 - 1900). Logged soil samples retrieved from Boring FD-87-2 (B) and conducted five down hole vane shear tests. Drillers located drill rig over FD-87-B (0700 - 1100) with some difficulties due to rain and subsequent soft boring access. Advanced Boring FD-87-2 (B) from the surface to its termination depth of 43 feet (1100 - 1900). Terry Wong on-site (0830 - 1430).

TABLE I

SUMMARY OF ACTIVITIES (cont'd)

Thursday, May 28, 1987 (cont'd)	Tony Firicano (Corps of Engineers) on-site (1200 - 1300).
	John Hart (Corps of Engineers) on-site (1200 - 1300).
Friday, May 29, 1987	- Geotechnical Engineer demobilized from Simsbury, Connecticut. Delivered all collected soil samples (26 jars) to the Corps of Engineers in Waltham, Massachussetts.
	Demobilized drill rig and drillers.

TABLE II

CONVERSATION LOGS

DATE	CONVERSATION
Wednesday, March 25, 1987	- Met with Terry Wong (Corps of Engineers) regarding inspection and exploration instructions. SPT's will be taken in five-foot intervals, starting at the surface. Vane Shear Tests will be on ten-foot intervals once in the varved clay. Surface elevations of Borings FD-87-A and FD-87-B were given as 177.61' and 150.95', respectively. Met on-site with Mike Griffiths (of Simsbury Water Pollution Control), who is familiar with the affected land owner and will clear right of entry.
Thursday, April 23, 1987	- Telecom with Terry Wong regarding: Atlantic Testing Laboratories, Limited, is to supply data sheet to record vane shear information. Only ultimate undisturbed and remolded strengths required. Collect soil samples in either two-pint jars or one-quart jars.
Monday, May 4, 1987	- Telecom with Terry Wong regarding: ATL will mobilize to jobsite on May 26, 1987.
Tuesday, May 5, 1987	- Telecom with Terry Wong regarding: A three-inch diameter van can be used in lieu of a 3-5/8-inch vane.
Friday, May 22, 1987	- Telecom with Terry Wong regarding: ATL will mobilize to site on May 26, 1987. Telecom with Mike Griffiths regarding: ATL will mobilize to site on May 26, 1987.
Tuesday, May 26, 1987	- Telecom with Mark Vance, a representative with the Corps of Engineers who took project update information in Terry Wong's absence.
Wednesday, May 27, 1987	- Met on-site with Terry Wong regarding project update.
Thursday, May 28, 1987	- Met on-site with John Hart who requested vane shear intervals to be changed from 10 feet to 5 feet in Boring FD-87-2 (B).

SECTION 6

CHAIN OF CUSTODY LOG

ATLANTIC TESTING LABORATORIES, Limited

DACW-33-85-D-0011
D.O. # 021

CHAIN OF CUSTODY LOG

PROJECT: FARMINGTON RIVER
SIMSBURY, CT.

ITEMS:

Tubes NONE

Bottles NONE

Jar Samples FD-87-1 & FD-87-2 (2 BOXES)

Core Boxes NONE

Sampling Logs NONE

Date & Time Received	Date & Time Transferred	Comments	Custodian
AS SAMPLED	5/29/87 0930	PAUL FISHER	
5/29/87 0930	5/29/87 0930	Gerard Bodreau	GB

SECTION 7

SAFETY REPORT

WEEKLY SAFETY MEETING

NEDSO — Date held 5-27-87

THRU: Area Engineer, NEW ENGLAND Area — Time 0700-0730

TO: Safety Office, NED

1. Weekly safety meeting was held this date for the following personnel:

Contract No. DACW33-85-D-0011 D.O.#021 Contractor ATLANTIC TESTING LAB

Conducted By PAUL FISHER All personnel present (Contr) 3
(Sub) 0
(Govt) 0

Subjects discussed (Note, delete, or add):
EM 385-1-1, Section: _____

— Accident Prevention Plan LOCATION OF LOCAL HOSPITAL
— Individual Protective Equipment - HARD HAT + GLOVES
— Prevention of Falls - FROM DEREK OR STEEP SLOPES
— Back Injury, Safe Lifting Techniques -
— Fire Prevention - GASOLINE STORAGE
Sanitation, First Aid, Waste Disposal -
— Tripping Hazards - trash, hose, nails in lumber -
Staging, Ladders, Concrete Forms, Safety Nets -
Hand Tools, Portable Power Tools, Woodworking Machinery -
— Equipment Inspection & Maintenance (Zero Defects) - DRILL RIG
— Hoisting Equipment - DRILL RIG
— Ropes, Hooks, Chains and Slings - + CABLES (DRILL RIG)
Electrical Grounding, Temporary Wiring, GFCI -
— Lockouts for safe clearance procedures - electrical, pressure, moving parts -
Welding, Cutting -
Excavations -
— Loose Rock and Steep Slopes -
Explosives -
— Water Safety - WORK NEXT TO FARMINGTON RIVER
Toxic materials - hazards, MSDS, respiratory, ventilation -
Other -

Prepared by PAUL FISHER Title ENG.

2. Forwarded. EXPOSURE TIME FOR 5/24/87 TO 5/28/87

CF: ATL 75.5 HRS
CORPS 15.0 HRS
SUB 0

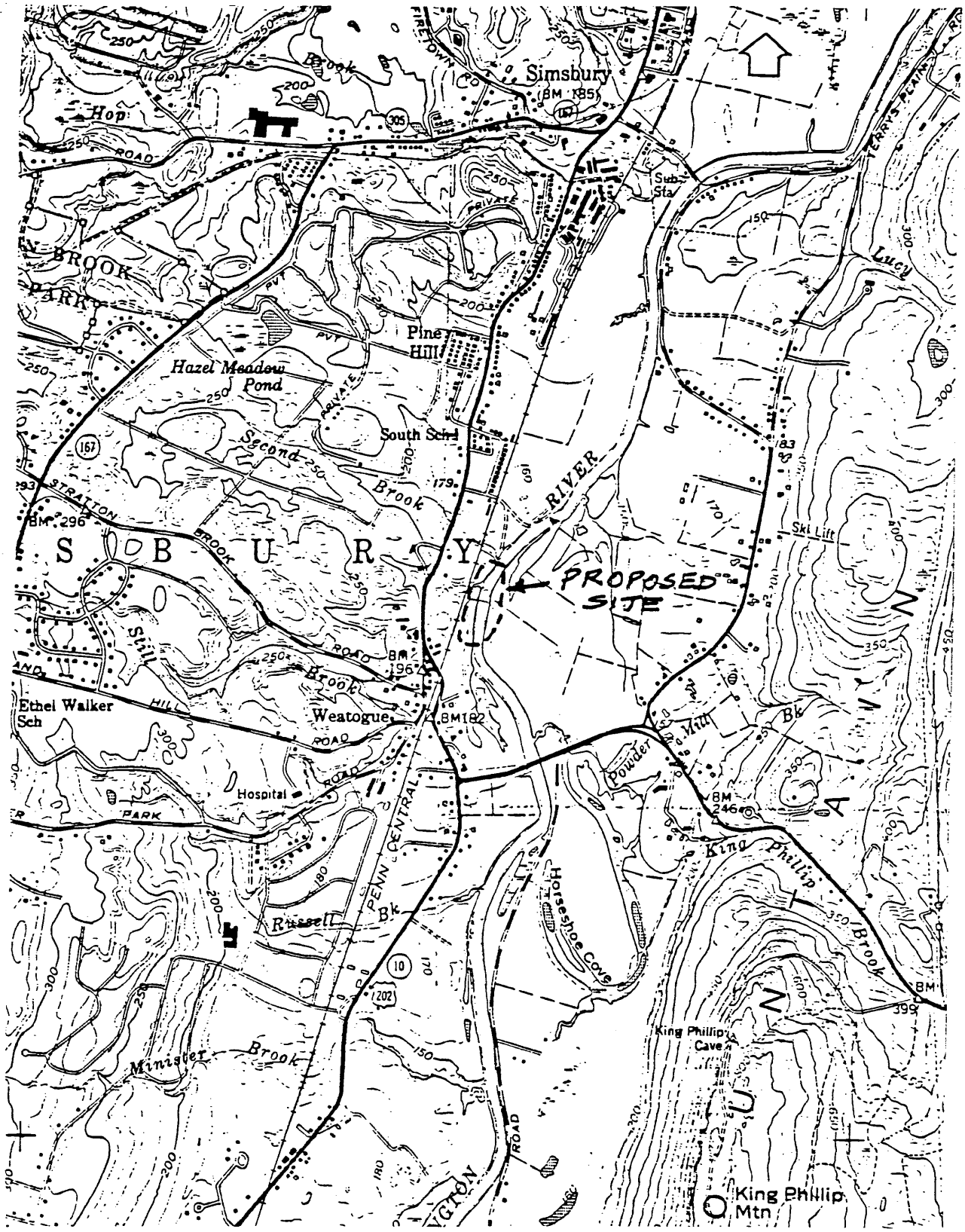
Signature _____
Resident Engineer

NED APP FL 251

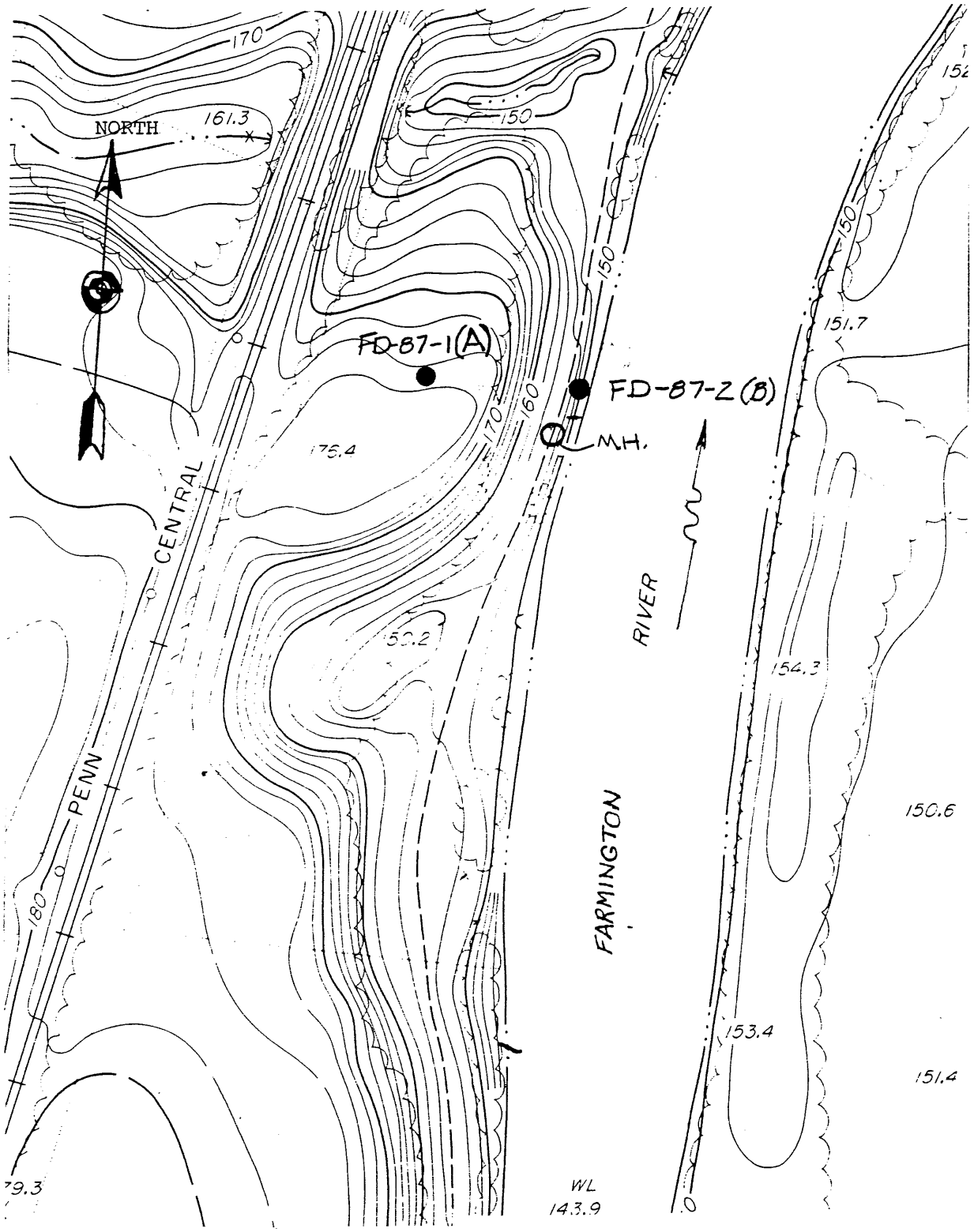
SECTION 8

FIELD INSPECTOR'S LOGS

NORTH



	SCALE	PROJECT No.	DATE
GENERAL PROJECT PLAN	1:24,000	CD023	6-05-87
FARMINGTON RIVER SIMSBURY, CONNECTICUT	ATLANTIC TESTING LABORATORIES, Limited BOX 28, CANTON, NY. 13617 BOX 356, CICERO, NY. 13039		



BORING LOCATION PLAN	SCALE 1" = 100'	PROJECT No. CD023	DATE 6-05-87
FARMINGTON RIVER SIMSBURY, CONNECTICUT	ATLANTIC TESTING LABORATORIES, Limited BOX 28 CANTON, NY. 13617		BOX 356 CICERO, NY. 13039

FD-87-1

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. DACW-33-85-D-0011, DO #021

Site FARMINGTON RIVER, SIMSBURY, CT — Page 1 of 8 Pages

Hole No. FD-87-1 (A) Diam. (Casing) 4¼ AUGER — Boring Started 5-27-87

Co-ordinates: N SEE E SKETCH — Boring Completed 5-27-87

Drilled by PAUL DAVIS + TODD BURNHAM — Report Submitted YES

Purpose of Exploration FOUNDATION CONDITION FOR RIVER BANK PROTECTION

Elevation Top of Hole 177.61 M.S.L.
Total Overburden Drilled 55.5 Feet
Elevation Top of Rock 122.1 M.S.L.
Elevation Bottom of Hole 121.1 M.S.L.
Total Rock Drilled 1.0 Feet
Total Depth of Hole 56.5 Feet
Core Recovered ROLLER BIT, 0 %
Core Recovered — Ft.; — Dia. — In.
Soil Samples 1 3/8 In. Dia. 13 No.
Soil Samples — In. Dia. — No.

Casing Left in Place NONE Feet

Water Table Depth NOT STABLE

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	55.5	4¼" HOLLOW STEM AUGER FOLLOWED
"	"	BY 3 7/8 ROLLER BIT AND WATER
55.5	56.5	3 7/8 ROLLER BIT AND WATER

INDEX

Prepared by PAUL M FISHER (Field Data) — NONE (Lab. Data)

Submitted by ATLANTIC TESTING LAB

NED FORM DEC 63 121

REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site FARMINGTON R. SIMSBURY, CT Page 2 of 4 Pages

Boring No. FD87-1 Desig. (A) Diam. (Casing) 4¼ ID

Co-ordinates: N SEE SKETCH E

Elevation Top of Boring 177.61 M.S.L.
Total Overburden Drilled 55.5 Feet
Elevation Top of Rock 122.1 M.S.L.
Total Rock Drilled 1.0 Feet
Elevation Bottom of Boring 121.1 M.S.L.
Total Depth of Boring 56.5 Feet
Core Recovered — % No. Boxes —
Core Recovered — Ft : — Diam. — In.
Soil Samples 1 3/4 In. Diam. 13 No.
Soil Samples — In. Diam. — No.

Hammer Wt. 140# Boring Started 5-27-87
Hammer Drop 30"
Boring Completed 5-27-87
Casing Left NONE
Subsurface Water Data ON Page 6
Obs. Well NONE
Drilled By DAVIS + BURNHAM
Mfg. Des. Drill MOBILE B-57
Inspected By: PAUL FISHER
Classification By: PAUL FISHER
Classification By: —

DEPTH (1" = 2')	CORE/SAMPLE NO.	SIZE	DEPTH FEE RANGE	CORE RECVY	BLOWS PER FT.	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0	S1	1 3/8	60%		1	4¼" ID HOLLOW STEM AUGER	DK. BR. SILTY SAND TOPSOIL (SM)
					3		BR. mf + SAND, TRACE SILT (MOIST, NON PLASTIC) SM
2					4		
					3		
4							
6	S2	1 3/8	50%		3		BR. mf + SAND, SOME mf GRAVEL, TRACE SILT, (MOIST, NON PLASTIC) SM
					13		
					10		
8					9		
10							

GENERAL REMARKS:

Site FARMINGTON RIVER SIMSBURY, CT

Boring No. FD-87-1 (A)

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH / PENET.	BLOWS PER FT. / CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
12	S-3	3/8	100%	5 6 5 8	4 1/4" HOLLOW STEM AUGER	BR m-f SAND, TRACE SILT (MOIST, NON PLASTIC) SM BR SILT, SOME f SAND TRACE CLAY (MOIST SLIGHTLY PLASTIC) ML
14						
16	S-4	1 3/8	80%	5 7 10 10		BR. SILT, TRACE CLAY (WET, SLIGHTLY PLASTIC) ML
18						
20						
22	S-5	1 3/8	100%	3 5 6 6		SAME AS ABOVE
24						
26	S-6	1 3/8	100%	3 4 4 5		SAME AS ABOVE

Site FARMINGTON RIVER SIMSBURY, CT	Boring No. FD-87-1 (A)	Page 2 of 9

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH RECD	BLOWS PER FT. CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
28					4¼" I.D HOLLOW STEM AUGER FOLLOWED BY 3⅞ ROLLER BIT AND WATER	BR SILT, TRACE CLAY (SATURATED, SLIGHTLY PLASTIC) ML
30						
32	S-7	1⅜	100%	3 4 5 16		SAME AS ABOVE GRAVELLY SEAM
34					VANE SHEAR TEST @ 33.5'	
36	S-8	1⅜	100%	4 5 7 5		SAME AS ABOVE
38						
40						
42	S-9	1⅜	100%	3 3 4 4		SAME AS ABOVE
44					VANE SHEAR TEST @ 43.5'	

Site: FARMINGTON RIVER, SIMSBURY, CT

Boring No. FD-87-1 (A)

Page 5 of 9

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH RUN	BLOWS PER FT. / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
					4¼" ID HOLLOW STEM AUGER FOLLOWED BY 3 7/8" ROLLER BIT AND WATER	
46	S-10	1⅜	100%	4 3 6 5		BR SILT, LITTLE CLAY (SATURATED, MODERATELY PLASTIC) ML
48						
50	S-11A	1⅜	40%	14 18		BR mf SAND, TRACE SILT (SATURATED, NON PLASTIC) SP, FINE SAND SEAM
	S-11B			18 22		
52						RED cmf SAND SOME SILT, TRACE CLAY (WET, SLIGHTLY PLASTIC) SM
54						
	S-12	1⅜	70% OF 6"	14 100/0"	3 7/8" ROLLER BIT WITH WATER	SAME AS ABOVE DECOMPOSED ROCK
56						RED SHALE BEDROCK (ASSUMED)
					BORING TERMINATED @ 56.5'	
58						
60						

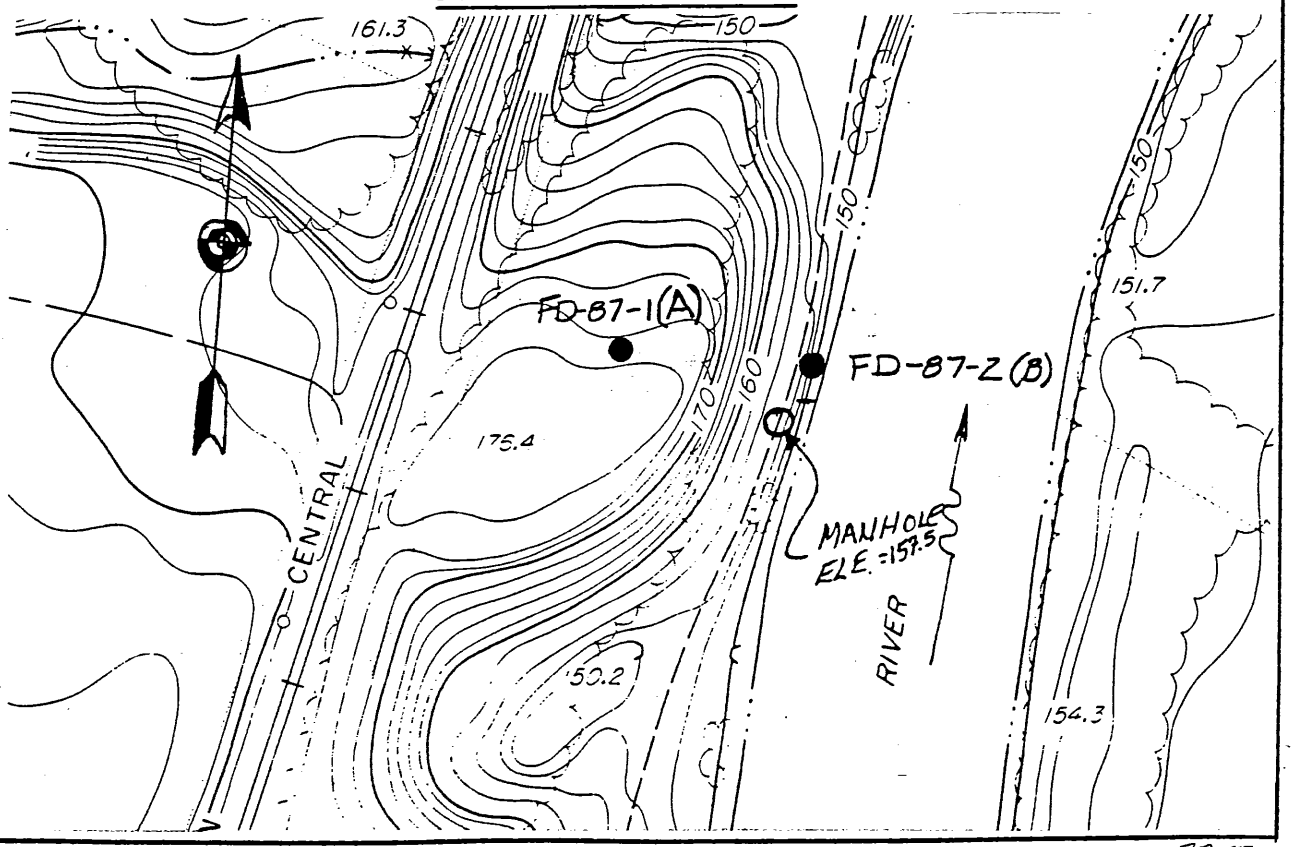
Site: FARMINGTON RIVER, SIMSBURY, CT
Boring No: FD-87-1 (A)

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
5/27/87	1700	55.0	56.5	@ SURFACE	—	NON STATIC WATER LEVEL DUE TO DRILLING WITH INDUCED WATER

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ATLANTIC TESTING LABORATORIES, Limited

FIELD VANE SHEAR TEST REPORT

PROJECT FARMINGTON RIVER BORING NO. FD-87-1

LOCATION SIMSBURY, CT TEST NO. 1

INSPECTOR PAUL FISHER TEST DATE 5-27-87

STATION SEE OFFSET SKETCH TEST TIME 1300

ELEV. TOP HOLE 177.61 DEPTH VANE TIP 33.5 ELEV. VANE TIP 144.1

VANE DIAMETER (2", 2-1/2", 3") 3" VANE CONSTANT 4.36

FRICTION ON VANE SHAFT		UNDISTURBED CONDITION		REMOLDED CONDITION	
ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)
			45		65

READINGS AND CALCULATIONS	UNDISTURBED CONDITION	REMOLDED CONDITION
MAXIMUM TORQUE READING FOR VANE (LBS)	45	65
MAXIMUM TORQUE READING FOR SHAFT (LBS)	1	1
TORQUE (LBS NET) = VANE READING - SHAFT READING	44	64
ULTIMATE SHEAR STRENGTH (psf) = VANE CONSTANT x TORQUE	192	279
SENSITIVITY = UNDISTURBED STRENGTH ÷ REMOLDED STRENGTH	0.69	

NOTES BR SILT, TRACE CLAY

1. For use with S & H Vane Shear Tester.
2. Perform according to ASTM D-2573.
3. To be used in undisturbed soft, saturated, cohesive soils.
4. Vane tip should penetrate undisturbed soil at least five times the hole diameter.
5. Rod rotation should not exceed 0.1° per sec (30 crank rotations per minute = 2 sec per one crank rotation).
6. Remold Strength will be recorded within one minute after ten rapid revolutions of vane.
7. Rod rotates one degree per five turns (1800:1 gear reduction)
8. Vane diameter x length (vane constant): 2" x 4" (14.67), 2-1/2" x 5" (7.50), 3" x 6" (4.36).

ATLANTIC TESTING LABORATORIES, Limited

FIELD VANE SHEAR TEST REPORT

PROJECT FARMINGTON RIVER BORING NO. FD-87-1

LOCATION SIMSBURY, CT TEST NO. 2

INSPECTOR PAUL FISHER TEST DATE 5-27-87

STATION SEE OFFSET SKETCH TEST TIME 1500

ELEV. TOP HOLE 177.61 DEPTH VANE TIP 43.5' ELEV. VANE TIP 134.1

VANE DIAMETER (2", 2-1/2", 3") 3" VANE CONSTANT 4.36

FRICTION ON VANE SHAFT		UNDISTURBED CONDITION		REMOLDED CONDITION	
ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)
			48		67

READINGS AND CALCULATIONS	UNDISTURBED CONDITION	REMOLDED CONDITION
MAXIMUM TORQUE READING FOR VANE (LBS)	48	67
MAXIMUM TORQUE READING FOR SHAFT (LBS)	1	1
TORQUE (LBS NET) = VANE READING - SHAFT READING	47	66
ULTIMATE SHEAR STRENGTH (psf) = VANE CONSTANT x TORQUE	205	288
SENSITIVITY = UNDISTURBED STRENGTH ÷ REMOLDED STRENGTH	0.71	

NOTES BR SILT, TRACE CLAY

1. For use with S & H Vane Shear Tester.
2. Perform according to ASTM D-2573.
3. To be used in undisturbed soft, saturated, cohesive soils.
4. Vane tip should penetrate undisturbed soil at least five times the hole diameter.
5. Rod rotation should not exceed 0.1^{o} per sec (30 crank rotations per minute = 2 sec per one crank rotation).
6. Remold Strength will be recorded within one minute after ten rapid revolutions of vane.
7. Rod rotates one degree per five turns (1800:1 gear reduction)
8. Vane diameter x length (vane constant): 2" x 4" (14.67), 2-1/2" x 5" (7.50), 3" x 6" (4.36).

FD-87-2

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. DACW-33-85-D-0011, DO #021

Site FARMINGTON RIVER, SIMSBURY, CT — Page 1 of 10 Pages

Hole No. FD-87-1 — Diam. (Casing) 4¼" AUGER — Boring Started 5-28-87

Co-ordinates: N SEE E SKETCH — Boring Completed 5-29-87

Drilled by PAUL DAVIS + TODD BURNHAM — Report Submitted YES

Purpose of Exploration FOUNDATION CONDITION FOR RIVER BANK PROTECTION

Elevation Top of Hole 150.95 M.S.L. — Casing Left in Place NONE Feet

Total Overburden Drilled 43.0 Feet

Elevation Top of Rock 108.0 M.S.L.

Elevation Bottom of Hole 108.0 M.S.L.

Total Rock Drilled 0 Feet

Total Depth of Hole 43.0 Feet

Core Recovered — %

Core Recovered — Ft.: — Diam. — in.

Soil Samples 1 3/8 in. Diam. 13 No.

Soil Samples — in. Diam. — No. — Water Table Depth NOT STABLE

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	43	4¼" ID HOLLOW STEM AUGER
		FOLLOWED BY 3⅞" ROLLER BIT
		AND WATER

INDEX

Prepared by PAUL M FISHER (Field Data) — NONE (Lab. Data)

Submitted by ATLANTIC TESTING LAB

NED FORM DEC 63 121

REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site FARMINGTON RIVER STAGING C — Page 2 of 10 Pages

Boring No. FD-87-2 Desig. B Diam. (Casing) 4 1/4" ID

Co-ordinates: N SEE SKETCH E —

Elevation Top of Boring 150.95 M.S.L. — Hammer Wt. 140# — Boring Started 5-28-87

Total Overburden Drilled 43.0 Feet — Hammer Drop 30" — Boring Completed 5-28-87

Elevation Top of Rock 108.0 M.S.L. — Casing Left NONE

Total Rock Drilled 0 Feet — Subsurface Water Data ON Page 5

Elevation Bottom of Boring 108.0 M.S.L. — Obs. Well NONE

Total Depth of Boring 43.0 Feet — Drilled By DAVIS + BURNHAM

Core Recovered — % No. Boxes — — Mfg. Des. Drill MOBILE B-57

Core Recovered — Ft : — Diam. — in. — Inspected By: PAUL M FISHER

Soil Samples 13/8 in. Diam. 13 No. — Classification By: PAUL M FISHER

Soil Samples — in. Diam. — No. — Classification By: —

DEPTH In Ft.	CORE/SAMPLE NO.	SIZE	DEPTH OF CORE RUN	BLOWS PER FT. CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
0	S-1A, S-1B	1 3/8	70%	5, 7, 9, 7	4 1/4 ID HOLLOW STEM AUGER FOLLOWED BY 3 7/8" ROLLER BIT AND WATER	DK. BR. m f + SAND, SOME SILT, LITTLE m f GRAVEL, TRACE ROOTS (MOIST, NON PLASTIC) SM, FILL
2						BR. c - f + SAND, SOME SILT (MOIST, NON PLASTIC) SM
4						
6	S-2A, S-2B	1 3/8	100%	5, 3, 4, 4		SAME AS ABOVE
8						TAN f. SAND, TRACE SILT, TRACE MICA (MOIST, NON PLASTIC) SP
10						

GENERAL REMARKS:

Site FARMINGTON RIVER
SIMSBURY, CT

Boring No. FD-87-2 (B)

Page 3 of 10

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH OF RANGE	BLOWS PER FT. CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
12	S-3A	1 3/8	90%	1 3 3 4	4 1/4" ID HOLLOW STEM AUGER FOLLOWED BY 3 7/8" ROLLER BIT AND WATER	BR. F. SAND TRACE SILT, TRACE MICA, (SATURATED, NON PLASTIC) SP
	S-3B					BROWN SILT, SOME CLAY (SATURATED, MODERATELY PLASTIC) ML-CL VARVED
14					VANE SHEAR TEST @ 13.5'	
16	S-4	1 3/8	80%	5 5 6 9		SAME AS ABOVE
18					VANE SHEAR TEST @ 18.5'	
20	S-5	1 3/8	100%	4 4 5 5		SAME AS ABOVE
22						
24					VANE SHEAR TEST @ 23.5'	
26	S-6	1 3/8	100%	5 6 5 6		SAME AS ABOVE

Site FARMINGTON RIVER SIMSBURY, CT

Boring No. FD-87-2 (B)

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH REC RANGE	BLOWS PER FT. CORE RECVY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
28					4 1/4" ID Hollow Stem Followed By 3 7/8" Roller Bit And Water	
					Vane Shear Test @ 28.5	
30						
	S-7	1 3/8	100%	WOR 2 4 4		Brown Silt, Some Clay (Saturated, Moderately Plastic) ML-CL, Varved
32						
					Vane Shear Test @ 33.5'	
34						
	S-8	1 3/8	100%	WOR 3 4 5		Same As Above
36						
						Br. m.f. Sand, Little Silt (Saturated, Non Plastic) SM
38						
40						
	S-9A	1 3/8	80%	25 50		Red cmf Sand, Some Silt Trace Clay (Wet, Slightly Plastic) SM
	S-9B			45		
42						
					Auger Refusal	
					Boring Terminated @ 43.0'	

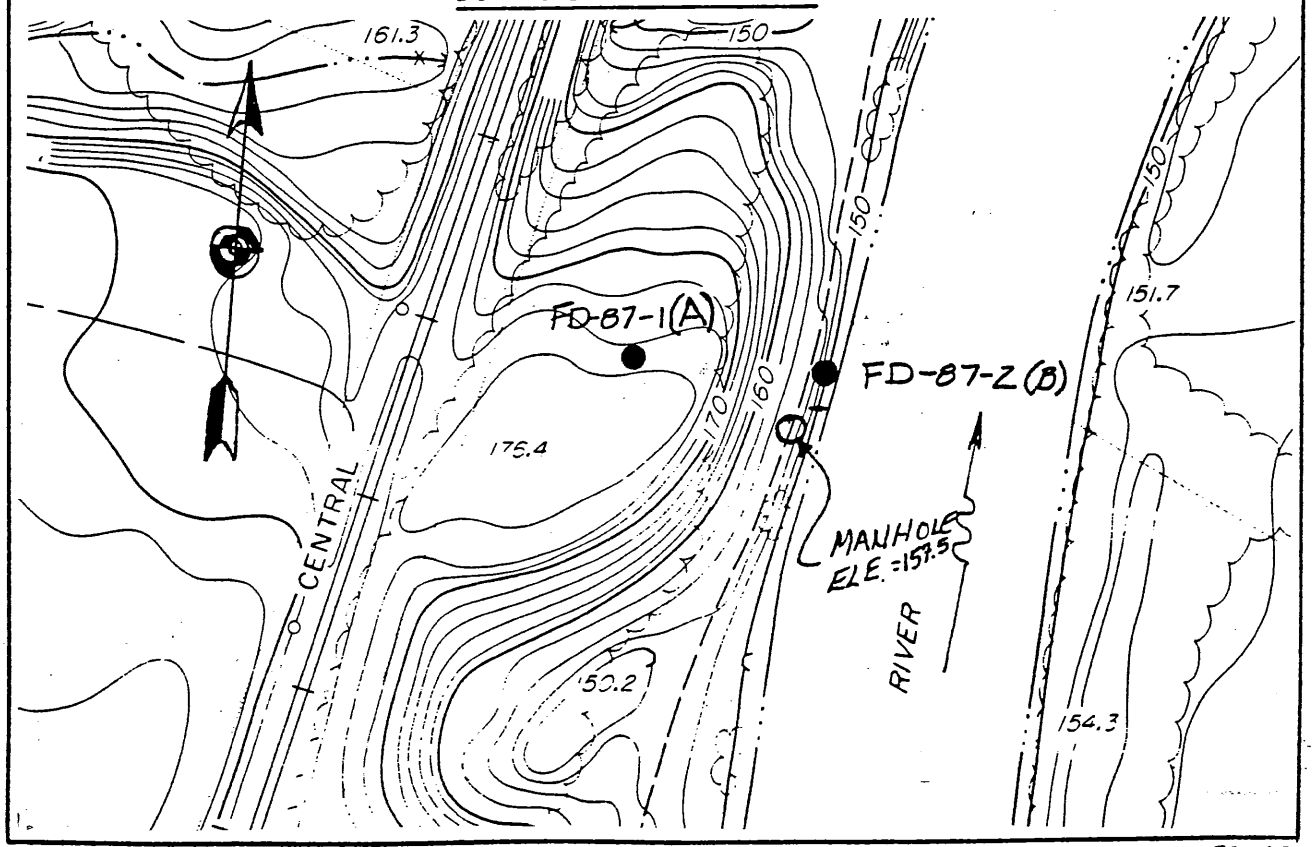
Site: FARMINGTON R., SIMSBURY, CT
Boring No: FD-87-2

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
5/28	1700	43.0	43.0	10'	141	END OF DRILLING
						NOT STATIC

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



ATLANTIC TESTING LABORATORIES, Limited

FIELD VANE SHEAR TEST REPORT

PROJECT FARMINGTON RIVER BORING NO. FD-87-2 (B)

LOCATION SIMSBURY, CT TEST NO. 1

INSPECTOR PAUL M FISHER TEST DATE 5-28-87

STATION SEE OFFSET SKETCH TEST TIME 1230

ELEV. TOP HOLE 150.95' DEPTH VANE TIP 13.5' ELEV. VANE TIP 138.5'

VANE DIAMETER (2", 2-1/2", 3") 3" VANE CONSTANT 4.36

FRICTION ON VANE SHAFT		UNDISTURBED CONDITION		REMOLDED CONDITION	
ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)
	0-2		160		80

READINGS AND CALCULATIONS	UNDISTURBED CONDITION	REMOLDED CONDITION
MAXIMUM TORQUE READING FOR VANE (LBS)	160	80
MAXIMUM TORQUE READING FOR SHAFT (LBS)	1	1
TORQUE (LBS NET) = VANE READING - SHAFT READING	159	79
ULTIMATE SHEAR STRENGTH (psf) = VANE CONSTANT x TORQUE	693	344
SENSITIVITY = UNDISTURBED STRENGTH ÷ REMOLDED STRENGTH	2.0	

NOTES

1. For use with S & H Vane Shear Tester.
2. Perform according to ASTM D-2573.
3. To be used in undisturbed soft, saturated, cohesive soils.
4. Vane tip should penetrate undisturbed soil at least five times the hole diameter.
5. Rod rotation should not exceed 0.1° per sec (30 crank rotations per minute = 2 sec per one crank rotation).
6. Remold Strength will be recorded within one minute after ten rapid revolutions of vane.
7. Rod rotates one degree per five turns (1800:1 gear reduction)
8. Vane diameter x length (vane constant): 2" x 4" (14.67), 2-1/2" x 5" (7.50), 3" x 6" (4.36).

ATLANTIC TESTING LABORATORIES, Limited

FIELD VANE SHEAR TEST REPORT

PROJECT FARMINGTON RIVER BORING NO. FD-87-2

LOCATION SIMSBURY CT TEST NO. 2

INSPECTOR PAUL M FISHER TEST DATE 5-28-87

STATION SEE OFFSET SKETCH TEST TIME 1350

ELEV. TOP HOLE 150.95' DEPTH VANE TIP 18.5' ELEV. VANE TIP 132.5

VANE DIAMETER (2", 2-1/2", 3") 3" VANE CONSTANT 4.36

FRICTION ON VANE SHAFT		UNDISTURBED CONDITION		REMOLDED CONDITION	
ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)
		11	120	5	30

READINGS AND CALCULATIONS	UNDISTURBED CONDITION	REMOLDED CONDITION
MAXIMUM TORQUE READING FOR VANE (LBS)	120	30
MAXIMUM TORQUE READING FOR SHAFT (LBS)	1	1
TORQUE (LBS NET) = VANE READING - SHAFT READING	119	29
ULTIMATE SHEAR STRENGTH (psf) = VANE CONSTANT x TORQUE	519	126
SENSITIVITY = UNDISTURBED STRENGTH ÷ REMOLDED STRENGTH	4.1	

NOTES

1. For use with S & H Vane Shear Tester.
2. Perform according to ASTM D-2573.
3. To be used in undisturbed soft, saturated, cohesive soils.
4. Vane tip should penetrate undisturbed soil at least five times the hole diameter.
5. Rod rotation should not exceed 0.1° per sec (30 crank rotations per minute = 2 sec per one crank rotation).
6. Remold Strength will be recorded within one minute after ten rapid revolutions of vane.
7. Rod rotates one degree per five turns (1800:1 gear reduction)
8. Vane diameter x length (vane constant): 2" x 4" (14.67), 2-1/2" x 5" (7.50), 3" x 6" (4.36).

ATLANTIC TESTING LABORATORIES, Limited

FIELD VANE SHEAR TEST REPORT

PROJECT FARMINGTON RIVER BORING NO. FD-87-2

LOCATION SIMSBURY, CT TEST NO. 3

INSPECTOR PAUL M FISHER TEST DATE 5-28-87

STATION SEE OFFSET SKETCH TEST TIME 1430

ELEV. TOP HOLE 150.95' DEPTH VANE TIP 23.5' ELEV. VANE TIP 127.5'

VANE DIAMETER (2", 2-1/2", 3") 3" VANE CONSTANT 4.36

FRICTION ON VANE SHAFT		UNDISTURBED CONDITION		REMOLDED CONDITION	
ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)
		5	18	2	11

READINGS AND CALCULATIONS	UNDISTURBED CONDITION	REMOLDED CONDITION
MAXIMUM TORQUE READING FOR VANE (LBS)	18	11
MAXIMUM TORQUE READING FOR SHAFT (LBS)	1	1
TORQUE (LBS NET) = VANE READING - SHAFT READING	17	10
ULTIMATE SHEAR STRENGTH (psf) = VANE CONSTANT x TORQUE	74	44
SENSITIVITY = UNDISTURBED STRENGTH ÷ REMOLDED STRENGTH	1.7	

NOTES

1. For use with S & H Vane Shear Tester.
2. Perform according to ASTM D-2573.
3. To be used in undisturbed soft, saturated, cohesive soils.
4. Vane tip should penetrate undisturbed soil at least five times the hole diameter.
5. Rod rotation should not exceed 0.1° per sec (30 crank rotations per minute = 2 sec per one crank rotation).
6. Remold Strength will be recorded within one minute after ten rapid revolutions of vane.
7. Rod rotates one degree per five turns (1800:1 gear reduction)
8. Vane diameter x length (vane constant): 2" x 4" (14.67), 2-1/2" x 5" (7.50), 3" x 6" (4.36).

ATLANTIC TESTING LABORATORIES, Limited

FIELD VANE SHEAR TEST REPORT

PROJECT FARMINGTON RIVER BORING NO. FD-87-2

LOCATION SIMSBURY, CT TEST NO. 4

INSPECTOR PAUL M FISHER TEST DATE 5-28-87

STATION SEE OFFSET SKETCH TEST TIME 1515

ELEV. TOP HOLE 150.95' DEPTH VANE TIP 28.5' ELEV. VANE TIP 122.5'

VANE DIAMETER (2", 2-1/2", 3") 3" VANE CONSTANT 4.36

FRICTION ON VANE SHAFT		UNDISTURBED CONDITION		REMOLDED CONDITION	
ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)
		1.8	50	2	8
		5	70	20	8
		9	100		
		12	130		

READINGS AND CALCULATIONS	UNDISTURBED CONDITION	REMOLDED CONDITION
MAXIMUM TORQUE READING FOR VANE (LBS)	135	8
MAXIMUM TORQUE READING FOR SHAFT (LBS)	1	1
TORQUE (LBS NET) = VANE READING - SHAFT READING	134	7
ULTIMATE SHEAR STRENGTH (psf) = VANE CONSTANT x TORQUE	584	31
SENSITIVITY = UNDISTURBED STRENGTH ÷ REMOLDED STRENGTH	19.1	

NOTES

1. For use with S & H Vane Shear Tester.
2. Perform according to ASTM D-2573.
3. To be used in undisturbed soft, saturated, cohesive soils.
4. Vane tip should penetrate undisturbed soil at least five times the hole diameter.
5. Rod rotation should not exceed 0.1° per sec (30 crank rotations per minute = 2 sec per one crank rotation).
6. Remold Strength will be recorded within one minute after ten rapid revolutions of vane.
7. Rod rotates one degree per five turns (1800:1 gear reduction)
8. Vane diameter x length (vane constant): 2" x 4" (14.67), 2-1/2" x 5" (7.50), 3" x 6" (4.36).

ATLANTIC TESTING LABORATORIES, Limited

FIELD VANE SHEAR TEST REPORT

PROJECT Farmington River BORING NO. FD-87-2

LOCATION Simsbury, CT TEST NO. 5

INSPECTOR Paul M Fisher TEST DATE 5-28-87

STATION See OFFSET Sketch TEST TIME 1630

ELEV. TOP HOLE 150.95' DEPTH VANE TIP 33.5' ELEV. VANE TIP 117.5'

VANE DIAMETER (2", 2-1/2", 3") 3" VANE CONSTANT 4.36

FRICTION ON VANE SHAFT		UNDISTURBED CONDITION		REMOLDED CONDITION	
ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)	ROTATION (DEGREES)	TORQUE READING (LBS)
		7	25		2

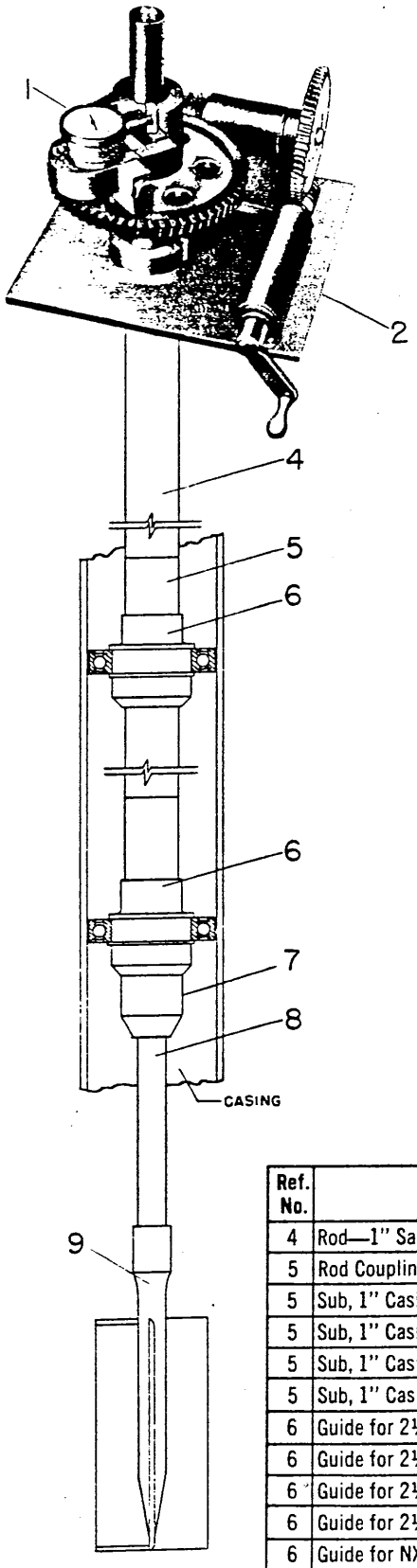
READINGS AND CALCULATIONS	UNDISTURBED CONDITION	REMOLDED CONDITION
MAXIMUM TORQUE READING FOR VANE (LBS)	25	2
MAXIMUM TORQUE READING FOR SHAFT (LBS)	1	1
TORQUE (LBS NET) = VANE READING - SHAFT READING	24	1
ULTIMATE SHEAR STRENGTH (psf) = VANE CONSTANT x TORQUE	105	4
SENSITIVITY = UNDISTURBED STRENGTH ÷ REMOLDED STRENGTH	24	

NOTES

1. For use with S & H Vane Shear Tester.
2. Perform according to ASTM D-2573.
3. To be used in undisturbed soft, saturated, cohesive soils.
4. Vane tip should penetrate undisturbed soil at least five times the hole diameter.
5. Rod rotation should not exceed 0.1° per sec (30 crank rotations per minute = 2 sec per one crank rotation).
6. Remold Strength will be recorded within one minute after ten rapid revolutions of vane.
7. Rod rotates one degree per five turns (1800:1 gear reduction)
8. Vane diameter x length (vane constant): 2" x 4" (14.67), 2-1/2" x 5" (7.50), 3" x 6" (4.36).

SECTION 9

OTHER RECORDS TAKEN



S & H VANE SHEAR TESTER

The S & H Vane Shear Tester is designed to permit "in place" readings of the shear strength of silts, clays and fine sands in combination with either silt or clay.

The torque assembly is equipped with a direct reading mechanical force gauge. The accuracy of the gauge is certified by the manufacturer.

Human error is reduced to a minimum by the 1800 to 1 worm gear reduction. In keeping with recent findings the recommended vanes are rectangular. These vanes are fabricated from stainless steel and have sharpened bottom edges to reduce disturbance of the soil during pressing. On special order pointed vanes can be furnished.

S & H 1" (25.4 MM) Sampler Casing is the standard torque rod; however, equipment can be furnished to permit the use of E, EW, or A rods.

The S & H Vane Shear Tester is designed for use in uncased, cased, or partially cased holes. However, casing is recommended for deep borings since there is no wall friction. When tests are being made in cased holes, ball bearing guides should be used at least every thirty feet (9 M).

A conversion chart is furnished with each unit to enable the user to convert the gauge reading to shear strength.

TORQUE ASSEMBLY

Ref. No.	Name	Part No.	Wt. Lbs.	Wt. Kg.
	Torque Assy., including:	A15518		
1	Force Gauge (Note 1)	15519	2.5	1.1
2	Base	15520	53	24
	Frame, Ground (Note 2)	15521	35	15.9

NOTES: (1) Force Gauges are available in two capacities: 0-500 lb. (0-226.8 kg.) reading in 5 lb. (2.3 kg.) graduations and 0-1000 lb. (453.6 kg.) in 10 lb. (4.6 kg.) graduations. Unless otherwise specified the 0-500 lb. gauge is furnished.

(2) A frame for attachment to 4" (101.6 MM) pipe (Part No. 15585) can be furnished in lieu of the Ground Frame. Subs are available to adapt this frame to other sizes of pipe and casing.

ACCESSORIES

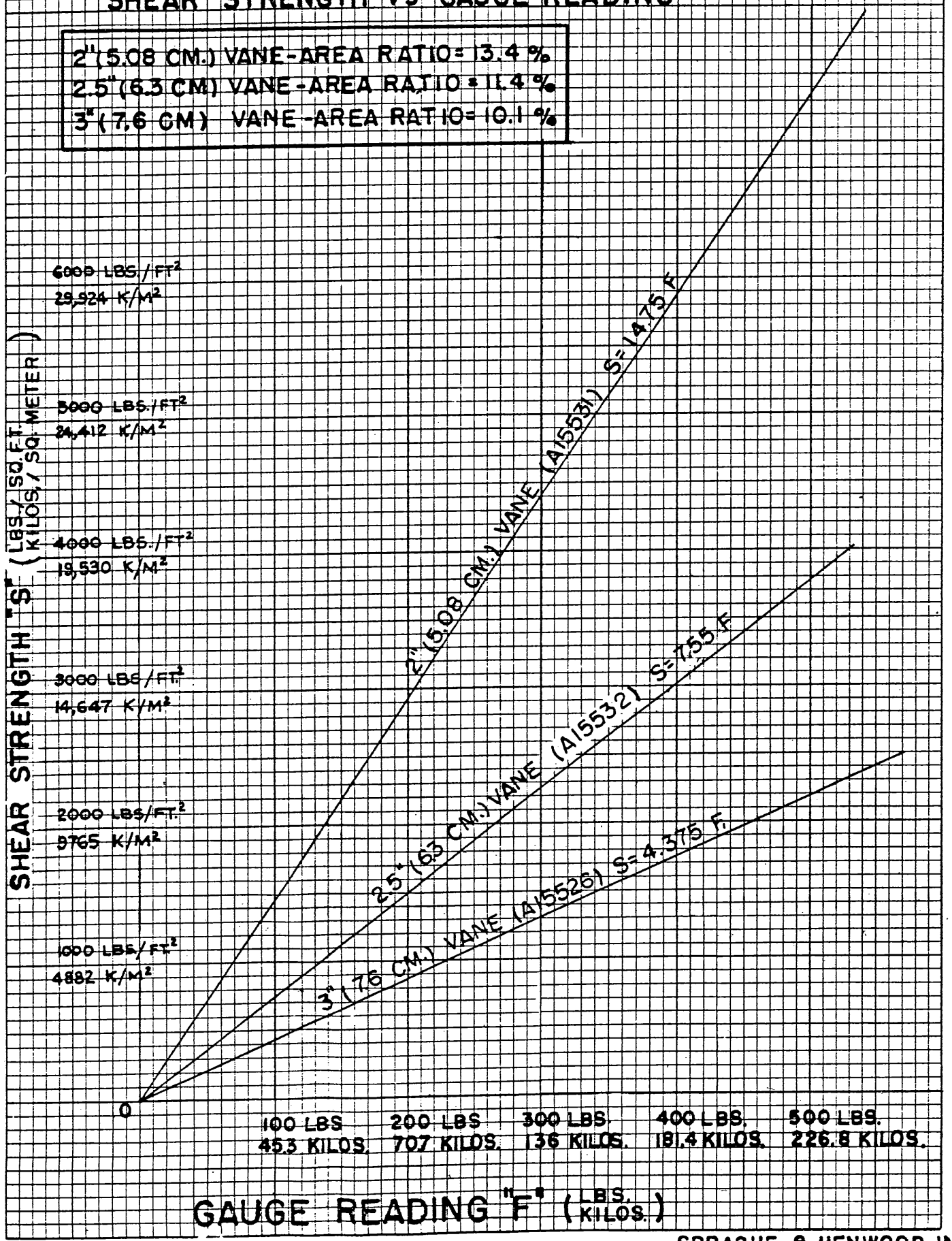
Ref. No.	Name	Part No.	Wt. Lbs.	Wt. Kg.
4	Rod—1" Sampler Casing (3 ft.)	15361	4.2	1.9
5	Rod Coupling	15360	.5	0.2
5	Sub, 1" Casing Pin to E Pin	15820	.75	0.3
5	Sub, 1" Casing Pin to EW Pin	15799	1	0.5
5	Sub, 1" Casing Pin to A Pin	15675	1.5	0.7
5	Sub, 1" Casing Pin to AW Pin	15778	1.9	0.9
6	Guide for 2½" Pipe, 1" Conn.	15769	1.2	0.5
6	Guide for 2½" Pipe, E Conn.	15770	1.2	0.5
6	Guide for 2½" Pipe, EW Conn.	15800	1.4	0.6
6	Guide for 2½" Pipe, A Conn.	15771	1.5	0.7
6	Guide for NX Casing, 1" Conn.	15766	1.8	0.8
6	Guide for NX Casing, E. Conn.	15767	1.8	0.8
6	Guide for NX Casing, EW Conn.	15812	2	0.9
6	Guide for NX Casing, A Conn.	15768	2	0.9
6	Guide for NX Casing, AW Conn.	15814	2.2	1

Ref. No.	Name	Part No.	Wt. Lbs.	Wt. Kg.
6	Guide for 4" Pipe, 1" Conn.	15763	2	0.9
6	Guide for 4" Pipe, E Conn.	15824	2	0.9
6	Guide for 4" Pipe, EW Conn.	15826	2.2	1
6	Guide for 4" Pipe, A Conn.	15765	2.2	1
6	Guide for 4" Pipe, AW Conn.	15819	2.5	1.1
7	Vane Adapter, 1" Conn.	15523	.25	0.1
7	Vane Adapter, E Conn.	15760	.25	0.1
7	Vane Adapter, EW Conn.	15803	.25	0.1
7	Vane Adapter, A Conn.	15673	.4	0.2
7	Vane Adapter, AW Conn.	15811	.4	0.2
8	Vane Rod	15525	3	1.4
9	2" Vane	15531	1.5	0.7
9	2½" Vane	15532	1.8	0.8
9	3" Vane	15526	2	0.9
	Steel Carrying Case	15794	12	5.4

S&H VANE SHEAR TESTER CONVERSION CHART

SHEAR STRENGTH vs GAUGE READING

2" (5.08 CM.) VANE-AREA RATIO = 13.4 %
2.5" (6.3 CM.) VANE-AREA RATIO = 11.4 %
3" (7.6 CM.) VANE-AREA RATIO = 10.1 %



SPRAGUE & HENWOOD INC.
SCRANTON, PA.